Summary

Introduction

The Firearm Incident Surveillance System was established by the Injury Prevention and Control Program of the Hawaii Department of Health to examine the demographic, geographic, criminal and medical circumstances of both fatal and non-fatal firearm-related injuries on Oahu. This report summarizes findings from the 3-year period 1995-97.

Total firearm-related injuries

- A total of 194 firearm-related injuries were identified through the surveillance system.
    - About half (96) of the victims were injured during assaults with a firearm, 32 fatally.
    - There were 62 firearm-related suicides and 6 suicide attempts.
    - Twenty-three of the injuries were unintentional in nature, none of which were fatal.
    - Seven injuries resulted from legal intervention, including 3 fatalities.
- The number of assaultive, suicidal and unintentional injuries all decreased over the 3-year period. Half of the suicides and unintentional injuries occurred in 1995.

Firearm-related assaults

- The 96 assaultive injuries resulted from 82 separate shooting incidents.
    - Only 16 (19%) of the incidents were known to occur between strangers.
    - The most common geographic areas for these incidents were Waipahu (14 incidents), Kalihi/Palama (13), and Waianae (9).
- Eighty percent (77) of the 96 victims of intentional shootings were males, but fatalities were significantly more common among female victims (12 of 19 victims killed, or 63%) than among male victims (20 of 77, or 26%).
- The risk of a fatal shooting was also much greater among victims who knew the perpetrator (24 of 53, or 45%), compared to those who were shot by a stranger (2 of 18, or 11%). (The victim-perpetrator relationship was not known for the remaining 25 cases.)
- Hospital records were reviewed for 70 of the 78 (90%) victims who did not die at the scene. Direct medical charges for these victims totaled over $1.5 million.
- Criminal information was available for approximately half (41) of the estimated 86 perpetrators involved in the assaults. More than half (23) had at least one previous criminal conviction, and 12 had previous convictions for violent offenses.
- Most (35, or 78%) of the perpetrators used a handgun in the shooting.

Firearm-related suicides and suicide attempts

- As with intentional shootings, most (60 of 68, or 88%) of the firearm suicide victims were male.
- More than half of the suicide victims (38) had detectable levels of either drugs or alcohol in their bloodstream at the time of the shooting. Drug or alcohol use was much more likely among male suicide victims (65%) than female victims (13%).

Unintentional firearm-related injuries

- Nineteen (83%) of the 23 victims were males, and all but 5 were 18 to 36 years of age.
- Sixteen of the injuries were self-inflicted, 4 victims were shot by family members or friends, and 2 apparently by stray bullets on New Year's Eve and Day.

Background

Firearm-related injuries are the second leading cause of injury death in the United States, after motor vehicle crashes. Over 30,000 firearm-related deaths occur each year in the United States, of which about 50% are suicides, 45% are homicides, and the remaining classified as unintentional.[1] Relatively less is known regarding non-fatal firearm-related injuries, although the Centers for Disease Control and Prevention recently estimated nearly 100,000 such injuries are treated in hospital emergency departments each year.[2]

The CDC has also reported that Hawaii ranked in the lowest 10% of all 50 states in both the number and rate of firearm-related deaths in 1997.[3] Despite these encouraging comparisons, firearms remain a prominent mechanism of fatal injuries in Hawaii, accounting for approximately 57 deaths per year over the 1989-98 time period.[4]

The Firearm Incident Surveillance System (FISS) was established by the Injury Prevention and Control Program (IPCP) of the Hawaii Department of Health in 1995 to examine and report the circumstances of both fatal and non-fatal firearm-related injuries on Oahu. Given the low number of firearm-related incidents and the small geographic area of Oahu, this system was designed to collect a greater depth of information on each incident than larger surveillance systems.[5] This report summarizes the 194 firearm-related injuries and deaths that were identified over the 1995-97 period, including description of the demographic, geographic, criminal and medical circumstances of these shootings.

Methods

This surveillance system utilizes data from three primary sources: incident reports from the Honolulu Police Department (HPD), Medical Examiner records, and medical records from four Oahu hospitals. Data are collected from each of these three sources using specific instruments, and are ultimately linked into a common computerized database. Records of gunshot wounds are initially identified by data specialists working independently at each of the three sources.

Police records

Gunshot wound incident data were identified and abstracted by police department personnel, then later reviewed and computerized by project staff. A seven-month time lag was allowed for the abstraction of police data to enable detectives time to complete their investigations of the incidents.

Hospital and medical examiner records

The surveillance system relies on four selected hospitals, since analysis of pilot data from 1992 and 1993 indicated over 90% of all gunshot wounds on Oahu were treated at these four institutions. Medical records personnel at those hospitals identified victims using a variety of methods, including the computerized review of the external cause of injury codes (E-codes), chief complaint and diagnosis fields, as well as manual record abstraction. Once incidents were identified, project staff from the Injury Prevention and Control Program abstracted the data from the hospital and Medical Examiner records.

Following the entry of the raw data from the three sources, the records were cross-matched to verify that all gunshot wounds had been identified. Ambulance reports from Emergency Medical Services System were also cross-matched with the merged data, to further identify any missing incidents.

Statistical analyses

Results are presented separately for firearm-related assaults, suicides and suicide attempts, and unintentional shootings. The former category is divided into information specific to each shooting incident, victim and perpetrator.

The locations of shooting incidents were categorized into “neighborhoods” and districts on Oahu, as delineated by the City and County of Honolulu Planning Department. Police beats were grouped into districts as specified by HPD. Annual population estimates from the Hawaii Department of Business, Economic Development and Tourism were used for the calculation of rate estimates.[6] Statistical tests were conducted with t-tests for continuously distributed variables and chi-squared tests for categorical variables. Differences described as “significant” were tested at the 95% confidence level.

Findings

Overview

A total of 194 firearm-related injuries were documented through the surveillance system over the 3-year period, exactly half of which (97) were fatal (Table 1). The injuries in Table 1 are grouped by intent, as the remainder of the Findings section will discuss the shooting incidents and the resulting injuries within these 4 intent categories.

Table 1. Firearm-related injuries on Oahu, by intent of shooting, 1995-97.

Intent of shooting	Non-fatal injuries	Fatal injuries	Total number of injuries
assaults	64	32	96
suicide	6	62	68
unintentional (or "accidental")	23	0	23
legal intervention	4	3	7
total	97	97	194

Half of the injuries (96) were the result of assaults with firearms, and approximately one-third (68) were suicidal. The remaining 30 injuries were the result of unintentional shootings (23) or legal intervention (7).

I. Firearm-related assaults

Incidents

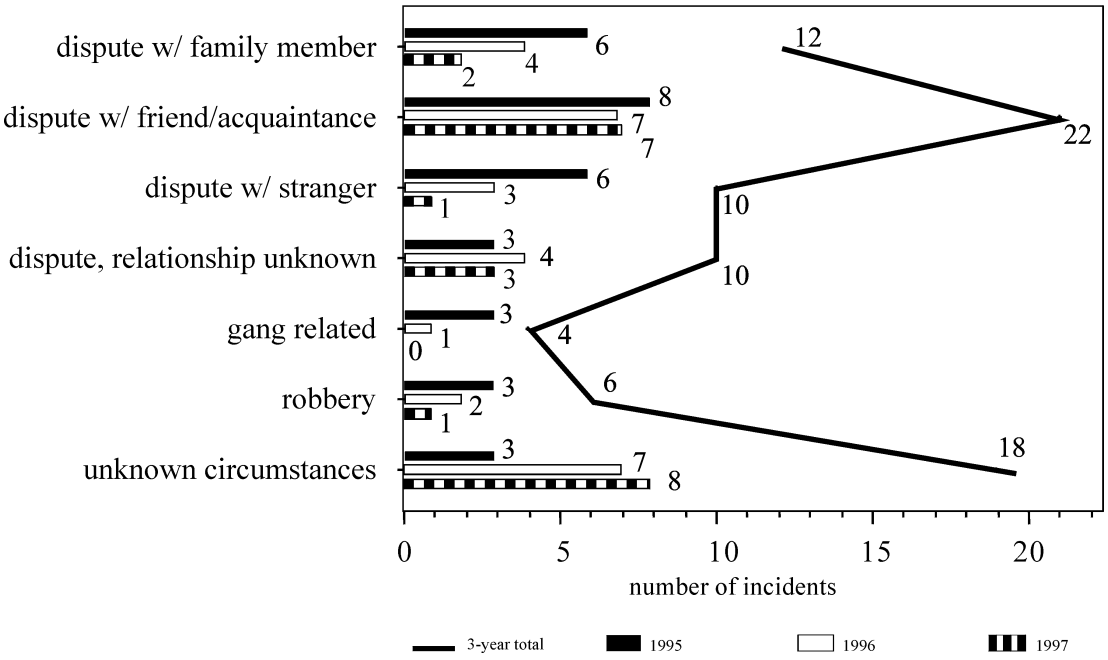
The 96 victims of firearm-related assaults were injured during 82 separate incidents, as 10 of the incidents involved more than 1 victim. Some of the characteristics of these shootings (e.g., nature of assault, geographic location, time of day, etc.) are described at the level of the incident in this section. Otherwise, the description of these characteristics would be inappropriately "weighted" by those shootings that had more than 1 victim. (The next section decribes other characteristics such as the age, gender, and medical disposition of the victim at the individual level.)

Nature of incident

There was a decreasing trend in the annual number of incidents: 32 in 1995, 28 in 1996, and 22 in 1997. Figure 1 summarizes the nature of these shooting incidents. In 22% (18) of the cases, however, there was not sufficient information to characterize the nature of the assault. Otherwise, the most common types of incidents were disputes among friends/acquaintances

(22 incidents, or 27%), family members (12, or 15%), or among victims and assailants for whom the inter-personal relationship could not be determined (10, or 12%). Only 10 of these incidents (12% of the total) were known to be disputes among strangers, and 6 (7%) resulted from robberies. Thus, the perpetrator(s) was not known to the victim(s) in only 19% of the incidents. (This estimate assumes robberies were among individuals not known to each other, and that gang-related shootings were among individuals known to each other.)

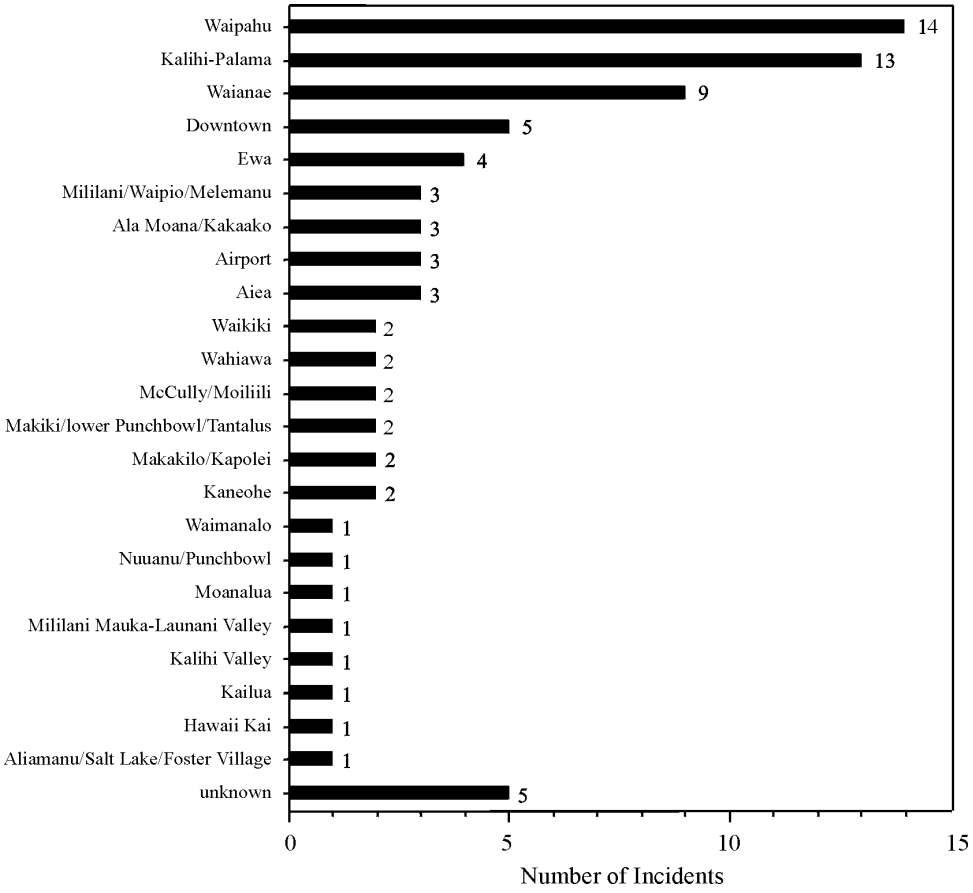
Figure 1: Nature of assaults resulting in firearm-related injuries on Oahu, 1995-97.



Location of incident

The Oahu neighborhoods of Waipahu, Kailihi/Palama, and Waianae each had the highest number of shooting incidents, accounting for 44% of the total (Figure 2). The geographic location of the shooting could not be determined for 5 (6%) of the incidents. The specific locations of the remaining 77 incidents are shown in Maps 1-3, in the Appendix.

Figure 2. Geographic distribution of firearm-related assaults on Oahu, 1995-97.



Nearly three-fourths (60, or 73%) of the incidents occurred in the following 4 Honolulu Police Districts: 18 in District 3 (central Oahu), 17 in District 5 (western metropolitan Honolulu), 15 in District 8 (the west coast of Oahu), and 10 in District 1 (eastern metropolitan Honolulu). There was no information on HPD District for 5 (6%) of the incidents. There were 7 incidents in HPD police beat 329, 4 incidents in beat 328, and 3 incidents in beats 327 and 39. There were 2 incidents each in beats 30, 35, 77, 323, 324, 326, and 335, while 46 other beats each had one incident.

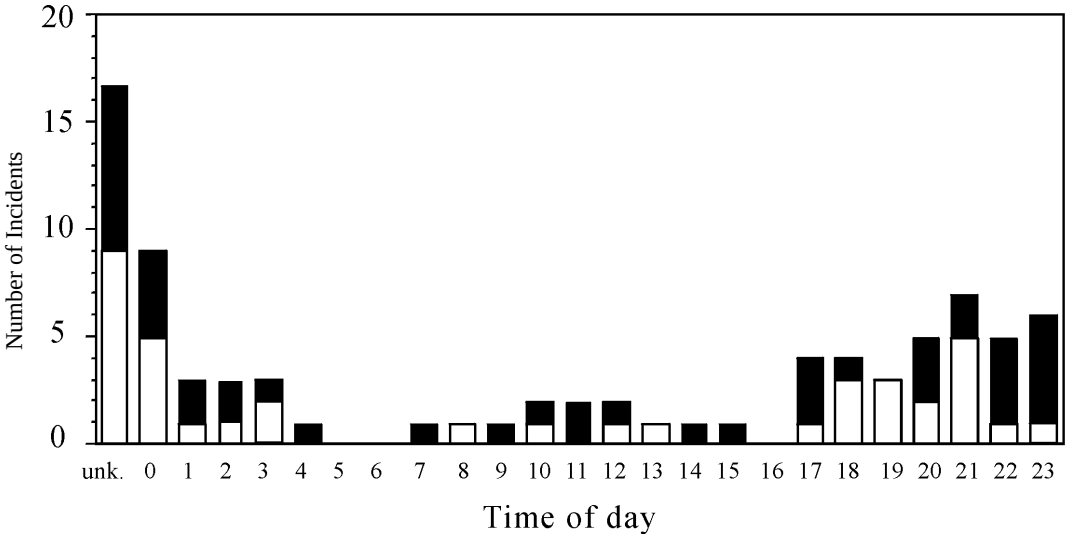
Almost half of the incidents (37) occurred in public streets or parking lots. Eighteen incidents (22%) were in the homes of the victim(s), and 5 (4%) in the home of the perpetrator(s). There were 3 incidents in the workplace, and 2 others in other public places.

Temporal characteristics

There was no apparent pattern for the month in which the shootings occurred, as the monthly total ranged from 5 to 10 shootings. Saturday was by far the most common day of the week on which shootings occurred (23, or 28%). In contrast, there were only 9 to 12 total incidents for the other days of the week. Slightly more than half (44, or 54%) of the incidents occurred

on a Friday, Saturday or Sunday. Shootings were also most common during late night hours, as 36 (44%) of the incidents happened between 9:00 p.m. and 3:00 a.m. Figure 3 summarizes the temporal characteristics of the shooting incidents.

Figure 3: Time of day (24-hour clock) of firearm-related assaults on Oahu, 1995-97. (Black bars indicate the proportion of shootings that occurred on a Friday, Saturday or Sunday.)

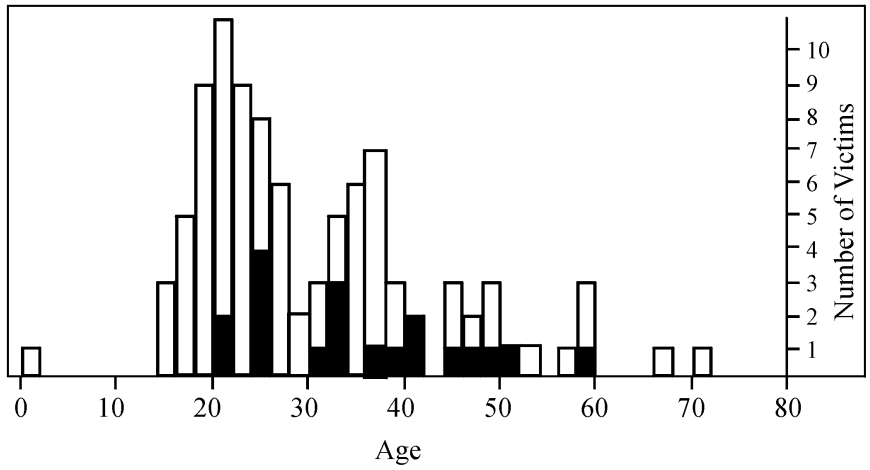


Victims

Age and gender of victims

A total of 96 individuals were injured in firearm-related assaults over the 3-year period, as 10 of the 82 incidents involved more than one victim. There were 38 victims injured in 1995, 31 in 1996, and 27 in 1997. One-third (32) of the victims died. Seventy-seven of the victims (80%) were males, and 19 were females. The average age of the victims was 30 years (standard deviation: 13 years), but there was a wide variation between the extremes of 5 months to 70 years (Figure 4). Eighty-percent of the victims were between 17 and 49 years of age, and nearly half (43, or 45%) were between 16 and 25 years of age. On the average, female victims were 7 years older than male victims (35 versus 28 years). (The average age for the male victims changes to 29 years if the 5 month-old is omitted.)

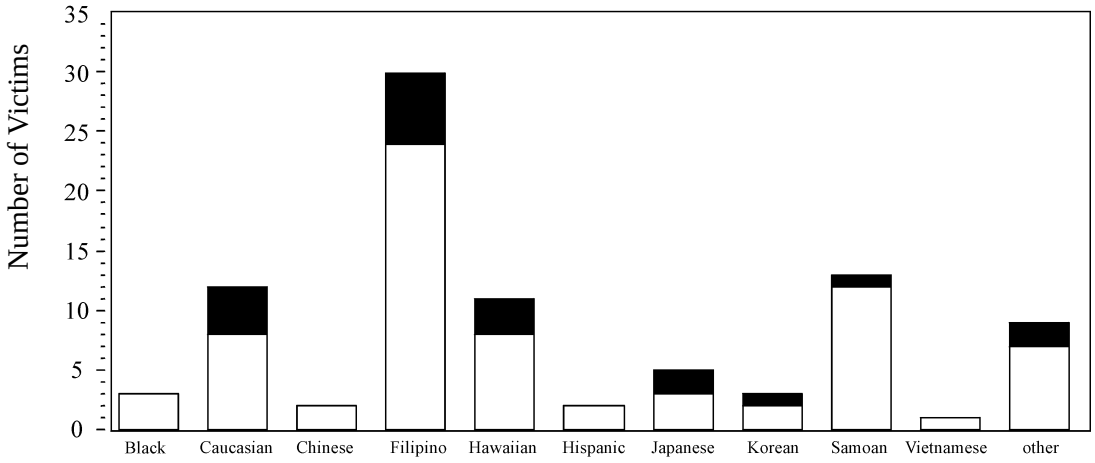
Figure 4: Age distribution of victims injured in firearm-related assaults on Oahu, 1995-97. (Shading indicates proportion of female victims.)



Ethnicity of victims

Eighty-three of the victims were residents of Hawaii (86%), and 2 were military personnel. Residence status could not be determined for the remaining 11 victims. Almost one-third (30) of the 96 victims were of Filipino ethnicity (Figure 5). There were approximately equal numbers of Samoan (13), Caucasian (12), and Hawaiian/part-Hawaiian (11) victims. Together, these 4 ethnicities comprised more than two-thirds (69%) of the sample of victims.

Figure 5: Ethnic distribution of victims injured in firearm-related assaults on Oahu, 1995-97. (Black bars indicate the proportion that were females.)



Substance use among assault victims

Information on the use of drugs and alcohol was available for 66 of the 96 victims (69%). Thirty-one victims had been drinking at the time of the incident, 23 had used drugs, and 9 had used both drugs and alcohol. Blood alcohol content was ascertained for 18 individuals, 13 of whom had a content of 0.08% or greater, the legal standard for intoxication for motorists in Hawaii.

Victim-perpetrator relationship

There was enough information to characterize the relationship between the victim and the perpetrator(s) for approximately three-fourths (71) of the victims (Table 2). Victims were nearly three times as likely to be shot by somebody they knew (53 victims), as opposed to a stranger (18 victims). Nine of the perpetrators were either the former or current spouse of the victim, and 5 were other members of the victim's family. There were an additional 33 perpetrators who were either friends, acquaintances, or coworkers of the victims, and 6 who were gang members. Female victims were significantly more likely to know the perpetrator (17 of 19, or 89%) than were male victims (36 of 77, or 47%). Nearly half of the female victims were shot by a former or current partner or spouse.

Table 2. Victim-perpetrator relationship for Oahu firearm-related assaults, by gender.

Relationship of perpetrator to victim	Female victims	Male victims	All victims
current/former partner or spouse	8	1	9
other family member	2	3	5
friend/acquaintance/coworker	7	26	33
gang-related	0	6	6
stranger	0	18	18
unknown relationship	2	23	25
total	19	77	96

Medical disposition of victims

The disposition of the 96 victims is summarized in Figure 6. (From Department of Health Vital Records, it is known that the 5 victims for whom disposition is "unknown" survived the shootings.) Only 14% of the victims were discharged from the emergency department (ED), while 48% were admitted to a hospital. Hospital records were located for 70 of the 78 victims who did not die at the scene of the shooting. The 70 victims spent a total of 375 days in the hospitals/emergency departments, with a range of less than a day to 56 days. Twenty-eight were hospitalized for a day or less, 23 more stayed between 2 and 6 days, and 19 were hospitalized for a week or more. Surgical operations were performed on approximately two-thirds (47) of the hospitalized victims.

Figure 6: Medical disposition of victims injured in firearm-related assaults on Oahu, 1995-97. (Black bars indicate the number of females, white bars indicate males, solid line indicates total.)

Hospital charges for victims' injuries

The total hospital charges associated with these 70 victims was over $1.5 million (Table 3). The average hospital charge was $22,400, with a range of $156 to $309,026. (If the victim who was hospitalized for 56 days is omitted, the average hospital charge is $18,183.) Hospital charges were less than $5000 for 27 victims, between $5000 and $10,000 for 13 victims, between $10,000 and $50,000 for 21 victims, and more than $50,000 for 8 victims. Table 3 gives a breakdown of hospital charges by the insurance status of the victims.

Table 3. Hospital charges for firearm-related assaults in Oahu, 1995-97.

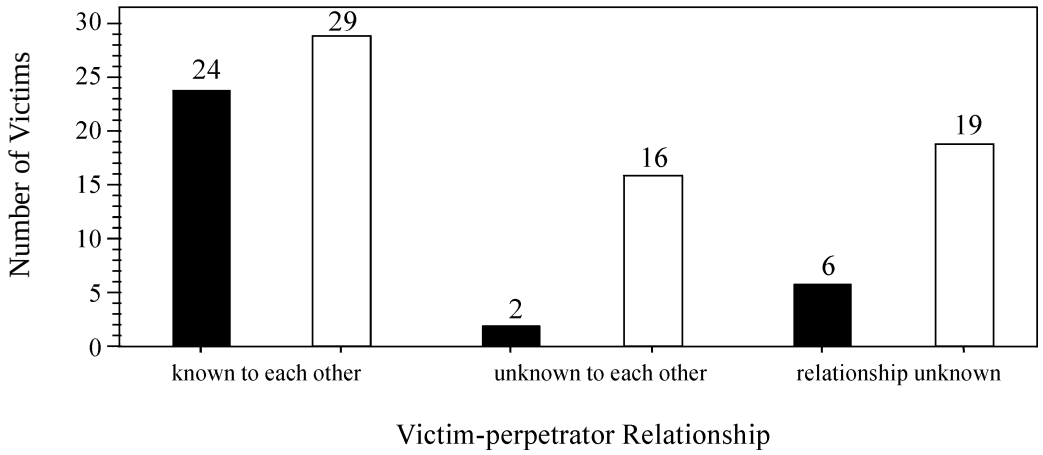
Source of payment	Number of victims	Total charges ($)	Percent of charges
private insurance	22	756,210	49
public	15	263,027	17
self-pay/uninsured	33	526,296	34
total	70	$1,545,533	100

Risk of fatal shootings: Influences of age, gender and victim-perpetrator relationship

As shown in Figure 6, female victims were much more likely to suffer a fatal firearm injury (12 out of 19 victims, or 63%) than were male victims (20 of 77, or 26%). The risk of a fatal shooting was also positively associated with the age of the victim, as the average age of the 32 victims killed in firearm incidents was higher than that among the survivors (33 versus 29 years, respectively).

There was also a strong association between the victim-perpetrator relationship and the risk of a fatal shooting (Figure 7). There were only 2 fatalities among the 18 (11%) victims who were shot by a stranger, while 24 of the 53 (45%) shootings between people known to each other resulted in a fatality. There was a lower rate of mortality (24%) among the remaining 25 victims for whom the victim-perpetrator relationship was unknown.

Figure 7: Lethality of firearm-related assaults, by victim-perpetrator relationship. (Fatal injuries indicated by black bars, non-fatal injuries by white bars.)



A multivariate logistic regression analysis was conducted to predict the independent influences of victim age, gender and victim-perpetrator relationship on the risk of a fatal firearm injury. This type of analysis is useful to disentangle the joint effects of age, gender and victim-perpetrator relationship, which are all interrelated. Age was grouped into three categories, using 23 and 35 years as cut-points to give approximately equal numbers in each age group. The victim-perpetrator relationship was characterized by three categories: the victim knew the perpetrator (the top 4 strata listed in Table 2), the perpetrator was a stranger to the victim, and the relationship between the victim and perpetrator was unknown. The results are listed in the table below.

Table 4. Odds ratios1 of a fatal vs. non-fatal firearm injury among 96 victims on Oahu, 1995-97. (95% confidence interval listed in parenthesis.)

Factor	Fatal/ non-fatal	Reduced model [2]	Full model [3]
Age of victim			
0-22 years (reference)	6 / 27	1.0	1.0
23-34 years	14 / 19	3.3 (1.1-10.8)*	3.2 (1.0-11.5)
35 years or older	12 / 18	3.0 (1.0-10.0)	2.4 (0.7-8.8)
Gender of victim			
male (reference)	20 / 57	1.0	1.0
female	12 / 7	4.9 (1.7-14.8)*	2.5 (0.8-8.2)
Victim-perpetrator relationship			
perpetrator known to victim (ref.)	24 / 29	1.0	1.0
perpetrator unknown to victim	2 / 16	0.15 (0.02-0.60)*	0.18 (0.03-0.81)*
victim-perp. relationship unknown	6 / 19	0.38 (0.12-1.06)	0.45 (0.13-1.36)

[1] Odds ratios estimate the chance of a fatal injury associated with one level of a factor relative to the reference level of that factor. For example: female victims were 4.9 times more likely to have a fatal injury than male patients in the reduced model. This estimate changed to 2.5 in the full model, after adjustment for victim age and relationship to perpetrator.

[2]The reduced model contains only one of the three main factors: victim age, gender or relationship to perpetrator.

[3]The full model contains all three of the main factors: victim age, gender or relationship to perpetrator. The advantage of the full model is that the odds associated with one factor are independent of the others.

* Denotes statistically significant odds estimate ($p<0.05$).

Victim age and gender were both significantly associated with the odds of a fatal shooting in the reduced models. However, the estimates for both age and gender decreased after considering all 3 factors together (full model). Victims who were shot by a stranger had significantly lower odds of a fatal injury, compared to victims who were shot by someone they knew. This was true in both the reduced and full models, suggesting a risk independent of the age and gender of the victim. In the full model, victims who were shot by someone they knew were more than 5 times more likely to die than those who were shot by a stranger.

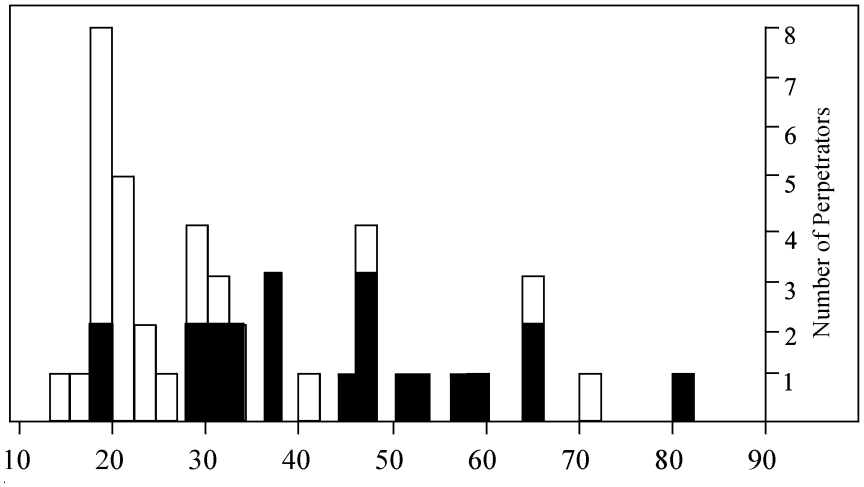
Perpetrators

There were at least 86 perpetrators involved in the 82 shootings identified over the 3-year period, as all but 3 incidents involved a single perpetrator. Only 41 of the perpetrators were arrested, however, so complete descriptive information is available for only about half of the perpetrators. (More limited information was available on 9 other perpetrators, 7 who were not arrested and 2 others who died during the incident.)

Age and gender of perpetrators

Gender was known for 50 of the perpetrators, including 7 who were not arrested, and 2 others that died during the incident. All but 4 (92%) of the perpetrators were males. Age was known for 45 of the perpetrators, and is summarized in Figure 8. The average age was 35 years, ranging between 15 and 80 years. Eleven perpetrators were under the age of 21, the legal age to own a firearm in Hawaii. Perpetrators involved in fatal shootings were generally older than those involved in non-fatal shootings (comparison of average age: 43 vs. 27 years). Forty-three (96%) of these perpetrators were residents of Oahu; only 1 was known to be a non-resident.

Figure 8: Age distribution of perpetrators involved in firearm incidents on Oahu, 1995-97. (Includes only those that were apprehended (n=45). Shading indicates proportion involved in fatal shootings.)



Criminal history of perpetrators

Arrest records were located for 40 of these perpetrators. Twenty-three (58%) of them had at least 1 previous criminal conviction, and 14 perpetrators had 3 or more previous convictions. Almost one-third (12 perpetrators) had previous convictions for violent offenses, offenses which might legally preclude the possession of a firearm in Hawaii.

Firearms used by perpetrators

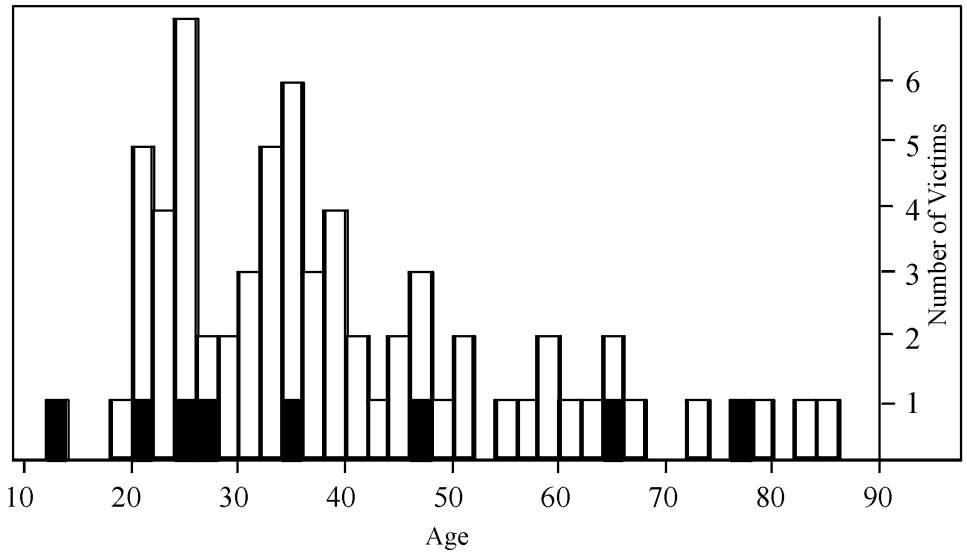
Most (35, or 78%) of these perpetrators used a handgun in the assault. Shotguns (3 incidents) and rifles (2 incidents) were less commonly used. Unfortunately, further information on the gun used in the shooting was mostly lacking. The registration status was determined for only 17 (38%) of the firearms: 12 were registered, and 5 were not. The relationship between the registered owner of the gun and the perpetrator was known in only 10 cases; 5 of the guns were registered to the perpetrator, 3 to friends or family members, 1 was purchased by the perpetrator and 1 was known to be stolen.

II. Firearm suicides/suicide attempts

Age and gender of suicide victims

There were 68 intentionally self-inflicted firearm injuries over the 3-year period, 62 of which were fatal. The annual number of victims decreased sharply from 32 in 1995 to 17 and 19 in 1996 and 1997, respectively. The age distribution of the 68 victims is shown in Figure 9. The average age of the victims was 39 years but the figure shows that age was broadly distributed (standard deviation: 17 years), within both genders. All but 8 of the victims (88%) were males. This predominance of male victims was similar to that among victims of intentional shootings (80%). Four of the victims were military personnel, and 2 were not residents of Oahu.

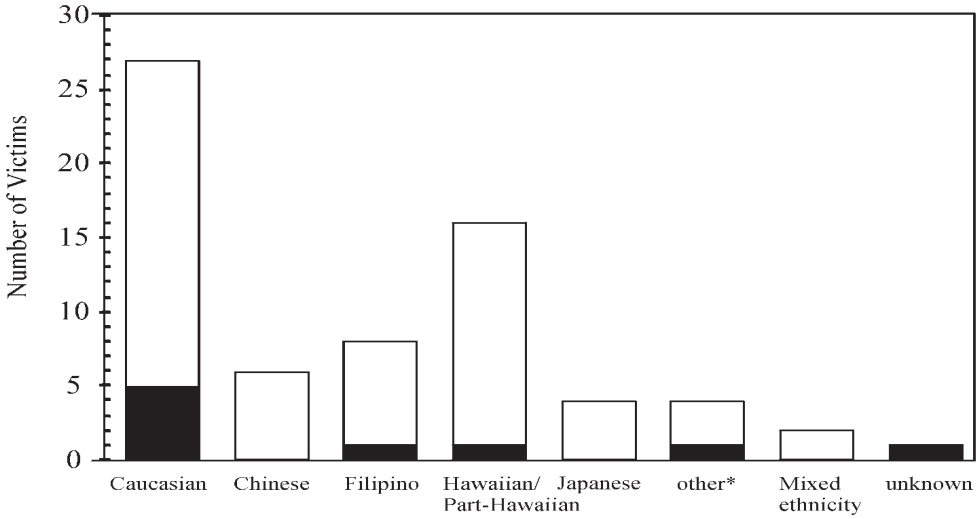
Figure 9. Age distribution of firearm suicide victims on Oahu, by gender, 1995-97. (Shading indicates proportion of female victims.)



Ethnicity of suicide victims

Almost two-thirds of the victims were of either Caucasian (27 victims, or 40%), or Hawaiian/ part-Hawaiian ancestry (16, or 24%) (Figure 10). All but 3 of the 8 female victims were Caucasian.

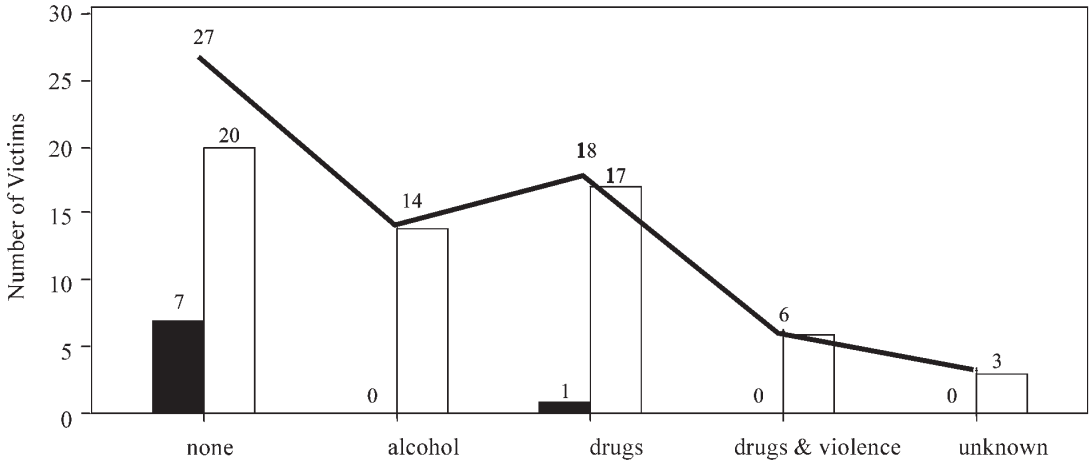
Figure 10. Ethnic distribution of firearm suicide victims on Oahu, 1995-97. (Black bars indicate the proportion that were females.)



Substance use among suicide victims

More than half of the victims (38) had used either alcohol or had detectable levels of drugs in their bloodstream at the time of the suicide (Figure 11). Figure 11 also shows that female victims were significantly less likely than male victims to have used alcohol or drugs (13% vs. 65%). Of the 20 victims who tested positive for alcohol (all were males), 15 had blood alcohol concentrations over 0.08 percent at the time the determination was made. Thirteen of the victims had used metamphetamine ("ice"), 5 had used marijuana, and 5 had used cocaine. Victims who had used alcohol or drugs were younger on average (37 years) than were victims who did not (44 years).

Figure 11. Alcohol or drug use among firearm suicide victims on Oahu, 1995-97. (Black bars indicate the number of females, white bars indicate males, solid line indicates total.)



Firearms used by suicide victims

As with intentional shootings, the majority of guns (65%) used in these 68 suicides/suicide attempts were handguns. Eleven victims used a rifle, 8 others used shotguns, and one a homemade "zip gun". Only 23 of the guns were known to be registered, although this information was missing in over half (39, or 57%) of the 68 incidents. Ten of the victims used guns registered to themselves, and 4 others used a family member's gun. Three guns were known to be stolen, among the 21 incidents for which this information was available.

Victims who committed suicide with firearms compared to other suicide victims

Firearms were involved in 21% (62 of 290) of all the suicides that occurred on Oahu in 1995-97. Basic demographic information was available to compare victims of firearm suicide to the 228 other suicide victims. The two groups were statistically comparable in terms of age, but male gender was significantly more common among firearm suicide victims (87% male), compared to the remaining suicide victims (69% male). The proportion of military personnel among firearm suicide victims was also higher than that among non-firearm suicide victims (11% vs. 5%), although such small numbers limit the validity of this comparison. There were no clear differences between the two groups in educational achievement or ethnic distribution, although the latter was difficult to fully evaluate.

An association between neighborhood of residence and the mechanism of suicide became apparent when the neighborhoods were grouped into districts: there was a higher proportion of residents of the Ewa district among the victims who committed suicide with a firearm, compared with victims of other forms of suicide (44% vs. 17%). Conversely, residents of the Honolulu district were less predominant among firearm suicide victims than among the victims of other types of suicides (27% vs. 47%). (Ewa district neighborhoods: Waipahu, Pearl City, Ewa, and Aiea. Honolulu district neighborhoods: Kalihi to Hawaii Kai, inclusive.)

III. Unintentional (or "accidental") shootings

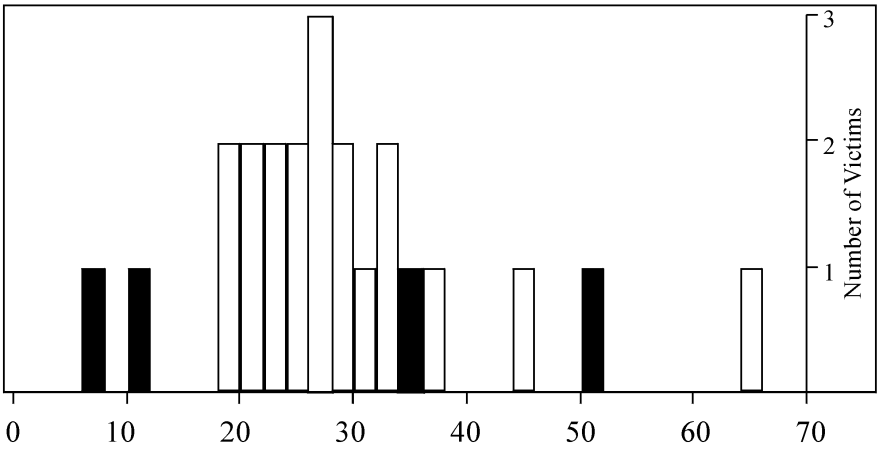
Overview

Twenty-three unintentional shootings were identified through the surveillance system over the 3-year period. Similar to firearm suicides, roughly half (11) of the unintentional injuries occurred in 1995; there were 6 each in 1996 and 1997. None of the injuries were fatal. Sixteen of the victims shot themselves, 3 were shot by a family member, 1 by a friend, and 2 others apparently by stray bullets. Both of the latter incidents occurred in 1997, 1 on New Year's Day, and the other on New Year's Eve. There were 2 other victims who shot themselves on these dates, 1 in 1995 and 1 in 1997. Five incidents involved a gun being played with or handled, 3 occurred during cleaning, and in 1 incident the victim was shot by his accomplice during an assault on another person.

Age and gender of victims injured

Nineteen (83%) of the victims were males. The average age was 28 years, with all but 5 victims between the ages of a range of 18 to 36 years (Figure 12). Only 2 victims were known to be drinking alcohol at the time of the incident. Handguns were involved in 14 (61%) of the incidents, shotguns in 4 incidents, and rifles in 3 incidents. There was little information available on the registration status of the gun; only 1 gun was known to be registered to the victim.

Figure 12: Age distribution of victims injured in unintentional firearm incidents on Oahu, 1995-97. (Shading indicates proportion of female victims.)



Hospital charges for injuries

All but one of the incidents consisted of a single gunshot wound. Nine (40%) of the victims were treated and released by hospital emergency departments, and 13 (57%) were admitted and later discharged from the hospital. (The hospital disposition was not known for 1 victim.) The victims spent a combined total of 86 days in hospitals, with the longest stay being 16 days. Total hospital charges amounted to $164,648, although this information was missing in 3 cases (Table 5). Approximately half of this total was paid by public insurance programs.

Table 5. Hospital charges associated with unintentional firearm injuries in 1995-97.

Source of payment	Number of victims	Total charges ($)	Percent of charges
insurance	12	68,463	42
public	5	83,927	51
self-pay	3	12,258	7
total	20	$164,648	100

IV. Firearm-related injuries from legal interventions

There were 7 firearm-related injuries that were the result of legal intervention over the 3-year period: 3 in 1995, and 2 each in 1996 and 1997. Three of the victims were killed; all were perpetrators committing violent crimes.

Conclusions and discussion

The descriptive findings contained in this report include some interesting observations on firearm-related injuries on Oahu. This section will further highlight some of those findings, including a discussion of the limitations of these data, and make some external comparisons with the rest of the United States.

About 45% of the total number of firearm-related assaults that were identified by this surveillance system occurred between people who knew each other. (Again, this implies the assumption that gang-related shootings were between people known to each other.) The victim-perpetrator relationship could not be determined for approximately one-third (29, or 35%) of the incidents, however, as some victims are reluctant or unable to implicate or identify their assailants. It is unlikely that this rate of missing information can be reduced in future data collection, which is similar to,[7] or lower than,[8,9] that reported from other surveillance systems of firearm-related injuries. Among the 53 shooting incidents for which this information was available, 37 (70%) occurred between people known to each other, including 12 that were intra-familial. Only 6 incidents appeared to involve an intent to rob.

Thirty-three of the incidents (40%) occurred in 3 “neighborhoods”. Although there are too few incidents for reliable rate calculations, it is clear that the areas of Waipahu, Kalihi/Palama, and Waianae are over-represented in terms of injuries from firearm-related assaults, for the number of people residing in these communities.

Likewise, the Filipino and Samoan ethnicities were over-represented among the sample of 96 victims of assaultive shootings. Comparative rate calculations are not feasible given the small numbers, but these two groups comprise an estimated 10 and 0.5% of the general population of Oahu, respectively, but 31% and 14% of the victims. Although the designation of ethnicity among residents of Hawaii is inherently ambiguous, there were only 6 cases in which there was disagreement in ethnicity among the different databases.

One-third (32) of the 96 injuries from firearm-related assaults were fatal. This is slightly higher than the 22% fatality rate reported from a national surveillance systems of firearm-related injuries.[1] Fatal injuries were more common among older victims, female victims, and victims who knew their assailants. However, since age, gender and victim-perpetrator relationship were all interrelated, it is difficult to describe the singular effects of these characteristics. Multivariate statistical modeling was used to separate these factors, and the results indicated that the risk of mortality among victims who knew their assailant was 5 times greater than that for victims who were shot by a stranger. Although this was a statistically significant estimate, it was based on relatively few cases (specifically, there were only 2 victims who were fatally shot by strangers), and should be interpreted with caution.

Since arrests were not made for all incidents, complete information was available for only about half of the estimated 86 perpetrators involved in firearm-related assaults. This is a limitation common to all firearm surveillance systems. Among the 45 perpetrators whose age was known, approximately one-quarter (11) were less than 21 years of age, and were therefore in unlawful possession of a firearm. Most (78%) of the perpetrators used handguns in the shootings, although little information was available regarding the ownership and registration status of the firearm. Ascertainment of this type of information, which may offer critical

support to legislative efforts, will involve data collection efforts beyond the design of the current surveillance system. Even then, it is possible that this information will remain unobtainable.

Compared to other mainland locales[3,10] and the country as a whole,[1] the rate of fatal injuries from firearm-related assaults on Oahu appears relatively low. Again, the following rate estimates are based on low numbers on Oahu and should be interpreted with caution. The 32 fatal injuries translate into a 3-year fatality rate of approximately 3.5/100,000 Oahu residents. This is much lower than the national estimate of 16.7/100,000 U.S. residents, recently reported by the CDC.[1] This disparity in rates was even more apparent among male victims, as the 3-year national rate for males was over 6 times greater than that for males on Oahu. This is partly because the proportion of males was higher among U.S. victims compared to victims on Oahu (87% vs 63%).

Rates of non-fatal injuries from firearm-related assaults are also lower for Oahu than for the United States as a whole. The CDC estimates the 3-year rate for 1995-97 was 59.6/100,000 residents.[1] In contrast, the 64 non-fatal injuries described by this surveillance system translate into a 3-year rate of 7.0/100,000 Oahu residents. It is important to note, however, that not all non-fatal firearm injuries were identified by the surveillance system, which would lead to an underestimation of the rate on Oahu. (The ascertainment of fatal shootings, both homicides and suicides, is believed to be complete, since they were identified through Medical Examiner records.)

The 3-year firearm-related suicide rate for the U.S. (20.6/100,000 residents) was also much higher than that computed for Oahu (6.7/100,000 residents).[1] Suicides were also less likely to be committed with a firearm among victims on Oahu (22%) than nationally (59%).[3]

Finally, unintentional firearm-related injuries were also much less likely on Oahu, compared to the rest of the U.S. Over the 1995-97 period, there were 3,379 people in the U.S. who were unintentionally killed by firearms,[1] compared to none on Oahu (nor in the entire state of Hawaii).[4] The estimated rate of non-fatal unintentional firearm-related injuries in the U.S. over this period was 17.4/100,000 residents.[1] As per suicides and assaults, this rate is of several magnitudes higher than that computed for Oahu residents (2.5/100,000).

Although the number of firearm-related injuries from assaults, suicides and unintentional incidents generally decreased over the 3-year period, there was no clear evidence of decreasing trends of firearm-related injuries. None of the observed decreases were of a sufficient magnitude to be considered statistically significant. Part of the reason for this is the overall small scale of firearm-related injuries on Oahu, but there were also inconsistent trends in the data. For example, although the total number of injuries from firearm-related assaults steadily decreased (38 victims injured in 1995, 31 in 1996, and 27 in 1997) the number of fatalities was relatively constant (12, 10 and 10, respectively). It should also be noted that the number of fatalities is more accurately enumerated than is the number of non-fatal injuries. Similarly, although half of the 62 firearm-related suicides occurred in 1995, the annual total actually increased from 1996 (13 victims) to 1997 (18 victims).

Given the small scale of firearm-related injuries on Oahu, it is unlikely that an accurate assessment of trend will be possible without the addition of many more years of data collection. However, the utility of the present information will probably best determine the need for

additional data collection. Future surveillance efforts would be augmented by data from other counties outside of Oahu, as DOH mortality statistics indicate firearm-related homicides and suicides are more common on Neighbor Islands and comprise a significantly greater proportion of the total number of homicides and suicides. In conclusion, although the present report does not clearly delineate any trends in firearm-related injuries, these surveillance efforts have hopefully contributed to the general description of these events, and in turn, their possible prevention.

Acknowledgments

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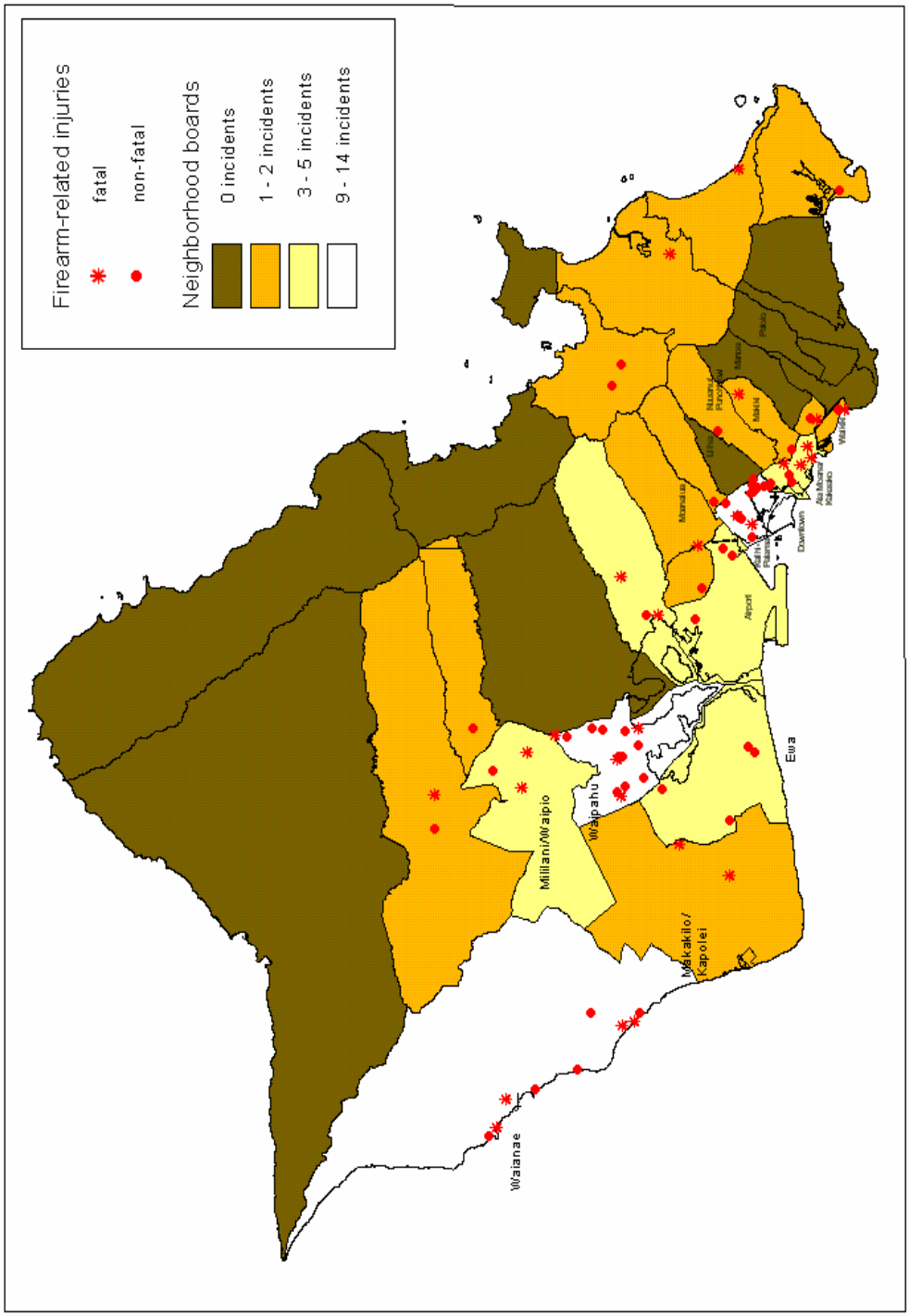
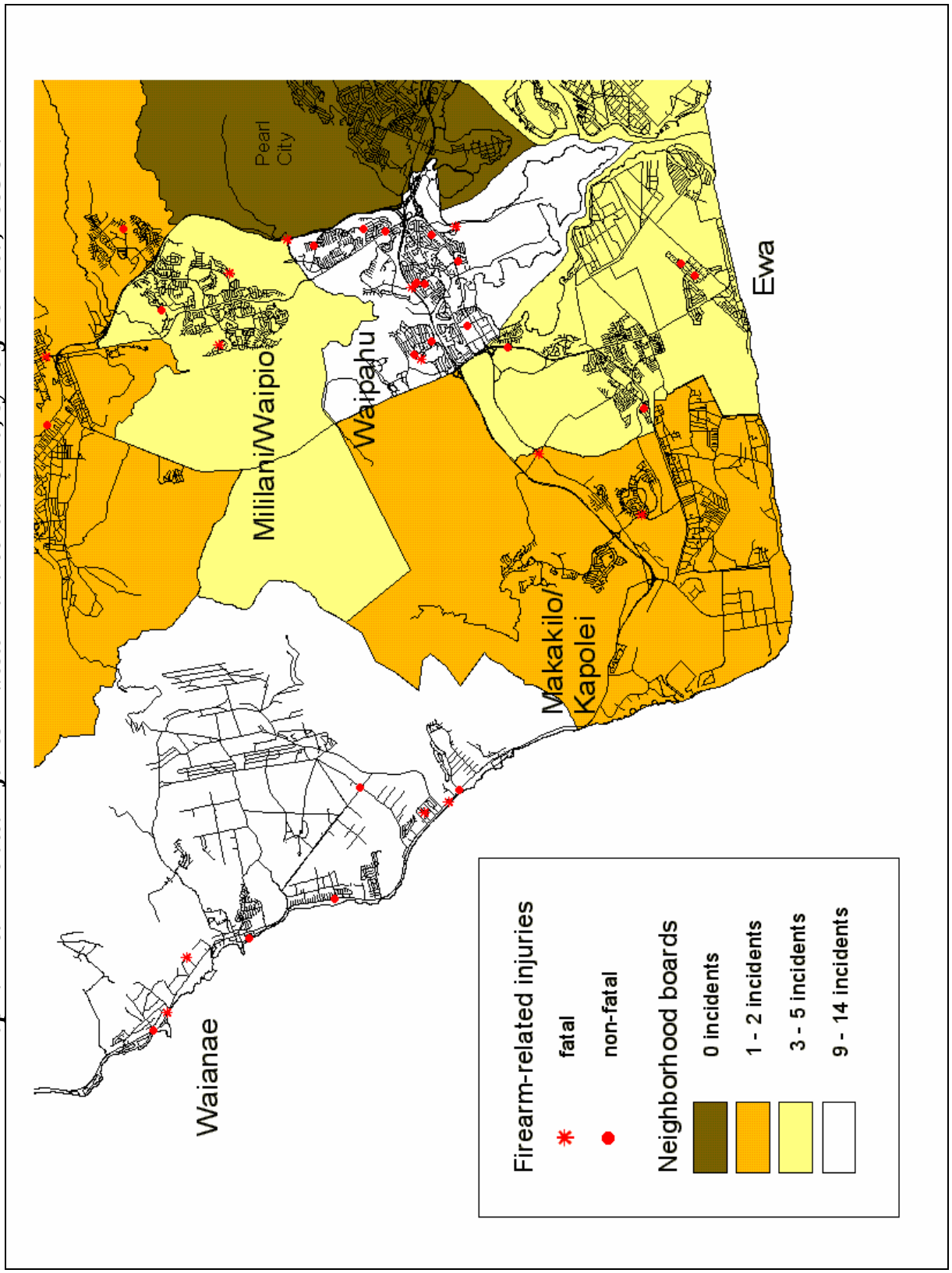
Appendix

Appendix: Geographic locations of firearm-related injuries on Oahu, 1995-97.
Map 1: Firearm-related injuries on Oahu, by neighborhood, 1995-97.



Map 2: Firearm-related injuries in western and central Oahu, by neighborhood, 1995-97.



Map 3: Firearm-related injuries in metropolitan Honolulu, by neighborhood, 1995-97.